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The n_TOF experiment - neutrons for nuclear technology, medicine & fundamental research

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The pulsed broad-range neutron time-of-flight facility n_TOF at CERN is a world-leading research facility for studying neutron-induced reactions. The CERN accelerator complex'high intensity short proton pulses impinge on a a massive gas cooled lead spallation target. The resulting high instantaneous intensity neutron pulses arrive at two experiment stations EAR1 and EAR2, at 185 m and 19 m respectively, operating in parallel together with the recently developed activation station NEAR roughly 2 meters from the spallation target. The instantaneous intensity allows the measurement with low mass and highly radioactive samples, not possible elsewhere. The use of a light water moderator yields a wide neutron energy range of more than eleven decades from meV to GeV without overlap from pulses.

The n_TOF collaboration, bringing together 140 researchers of 40 institutes from all over the world, is the world's largest community dedicated to measuring neutron induced cross sections. Over the course of two decades, more than one hundred experiments have been performed by the n_TOF Collaboration, in the domain of nuclear data for advanced technologies (neutron capture, neutron induced fission and (n,cp) reactions for accelerator driven systems, Gen-IV and Th/U fuel cycle), in nuclear astrophysics (heavy elements synthesis in stars, big bang nucleosynthesis, nuclear cosmo-chronology), and for fundamental nuclear science (nuclear structure and decay of highly excited compound states). Future plans for n_TOF include the development of detectors for reaction channels complementing neutron-induced capture, fission and light charged-particle reactions. This involves in particular the (n,xn) reaction channel and activation measurements at NEAR.

A brief overview of the facility and highlights of the experimental activities performed at n_TOF will be presented, with a particular emphasis on the Austrian contribution to the experimental programme, highlighting developments in the (n,xn) reaction channel.

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